

Research Article

# Induction of thymine dimers by solar radiation in natural freshwater phytoplankton assemblages in Patagonia, Argentina

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**Abstract.** Natural phytoplankton assemblages from a freshwater lake in Trelew (Province of Chubut, Patagonia, Argentina) were exposed to natural solar radiation at different depths in a water basin filled with fresh water rich in humic substances. Samples were taken at regular intervals for DNA extraction and subsequent analysis of DNA damage by determining the formation of thymine dimers using an immuno-dot-blot procedure. The use of a colorimetric detection system based on the reaction of alkaline phosphatase with BCIP (5-bromo-4-chloro-3-indolyl phosphate)/NBT (nitro blue tetrazolium) proved unsatisfactory because of uneven and strong background signals. As a consequence the antibodies were stripped and the blots were reprobed successfully, using a chemoluminescence based detection system. Natural solar radi-

ation caused an increase from  $3.2 \pm 0.9$  thymine dimers ( $T^{\wedge}T$ ) per mega base pair (Mbp) to  $50.9 \pm 3.8 T^{\wedge}T$  Mbp<sup>-1</sup> during the light period in natural phytoplankton exposed at the surface. When the UV-B component of the solar radiation was removed by a 320 nm cut-off filter, no thymine dimers were produced. After prolonged exposure at the surface, some but not total recovery occurred overnight. There was no significant DNA damage in the samples exposed at 85 cm depth ( $k_d = 3.62 \text{ m}^{-1}$  at 305 nm). The results indicate that the impinging UV-B radiation at the study site may be deleterious to the survival of phytoplankton exposed at the water surface and thus significantly alter the nutrient cycling and biomass production.

**Key words.** DNA damage; freshwater phytoplankton; repair; solar UV radiation.